PRODUCTIVITY AND GROWTH ACCOUNTING

Economic growth can be increased either by raising the labour and capital inputs used in production, or by greater overall efficiency in how these inputs are used together, *i.e.* higher multi-factor productivity (MFP). Growth accounting involves breaking down GDP growth into the contribution of labour inputs, capital inputs and MFP growth.

Definition

Growth accounting explains output growth by the rates of change of labour and capital inputs and by MFP growth, computed as a residual. In these calculations, the growth rates of labour and capital inputs are weighted with their respective share in total costs. Thus, for example, the contribution of labour to GDP growth is measured as the speed with which labour input grows, multiplied by the share of labour in total costs.

In the tables and graphs, the contribution of capital to GDP growth is broken down into Information and Communication Technologies (ICT) capital (which includes hardware, communication and software) and non-ICT capital (transport equipment and non-residential construction; products of agriculture, metal products and machinery other than hardware and communication equipment; and other products of non-residential gross fixed capital formation).

Comparability

The appropriate measure for capital input in the growth accounting framework is the flow of productive services that can be drawn from the cumulative stock of past investments in capital assets. These services are estimated by the OECD using the rate of change of the "productive capital stock". This measure takes into account wear and tear and retirements, *i.e.*, reductions in the productive capacity of the fixed assets. The price of capital services for each type of asset is measured as their rental price. In principle, the latter could be directly observed if markets existed for capital services. In practice, however, rental prices have to be imputed for most assets, using the implicit rent that capital goods' owners "pay" themselves (or "user costs of capital"). Accurate price indices in measuring

volume investment, capital services and user costs should be constant quality deflators that reflect price changes for a given performance of the ICT investment goods. There are differences how countries deal with quality adjustment with possible consequences for the international comparability of price and volume measures of ICT investment. The OECD uses a set of "harmonised" deflators assuming that the ratios between ICT and non-ICT asset prices evolve in a similar manner across countries, using the United States as the benchmark.

The measure of total hours worked is an incomplete measure of labour input because it does not account for changes in the skill composition of workers over time, such as those due to higher educational attainment and work experience. Adjustment for such attributes would provide a more accurate indication of the contribution of labour to production. In the absence of these adjustments, as is the case in the series shown here, more rapid output growth due to a rise in skills of the labour force are captured by the MFP residual, rather than being attributed to labour. This should be kept in mind when interpreting rates of MFP growth.

Overview

From 1985 to 2009, GDP growth in most OECD countries was for a large part driven by growth in capital and MFP. However, data shows large variations in terms of contributions of labour, capital and MFP to GDP growth. In many countries, growth in capital accounted for around one third of GDP growth from 1985 to 2009. Over the same period, ICT capital services represented between 0.2 and 0.6 percentage points of growth in GDP. The GDP-contribution from ICT capital was largest in Sweden, Denmark, the United Kingdom and the United States, and smallest in Ireland and Finland.

In contrast, growth in labour input was important for a few countries over 1985-2009, notably Australia, Spain, Ireland and Canada. However, Japan, Finland and Germany experienced negative GDP contributions of labour inputs. Over the same period, MFP growth was a significant source of GDP growth in Korea, Ireland and Finland, while its contribution was very small in Italy, Canada and Spain.

Sources

- *OECD Productivity Statistics.*

Further information

Analytical publications

- OECD (2011), *OECD Science, Technology and Industry Scoreboard 2011*, OECD Publishing.
- OECD (2004), *Understanding Economic Growth A Macro-level, Industry-level, and Firm-level Perspective*, OECD Publishing.
- OECD (2003), *The Sources of Economic Growth in OECD Countries*, OECD Publishing.

Methodological publications

- OECD (2001), *Measuring Productivity – OECD Manual Measurement of Aggregate and Industry-level Productivity Growth*, OECD Publishing.
- Schreyer, P. (2004), "Capital Stocks, Capital Services and Multi-factor Productivity Measures", *OECD Economic Studies*, Vol. 2003/2.
- Schreyer, P., P.-E. Bignon and J. Dupont (2003), "OECD Capital Services Estimates: Methodology and a First Set of Results", *OECD Statistics Working Papers*, No. 2003/6.

Websites

- OECD Compendium of Productivity Indicators, *www.oecd.org/statistics/productivity/compendium.*
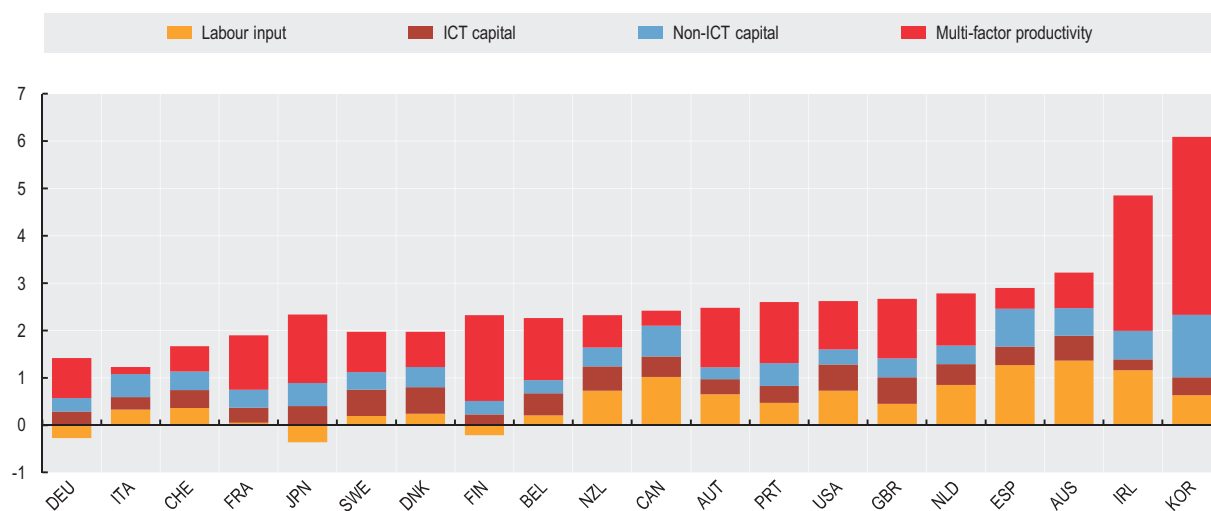- OECD Productivity, *www.oecd.org/statistics/productivity.*

Contributions to GDP growth

Average annual growth in percentage, 1985-2009 (or closest comparable period)

	Labour input	ICT capital				Non-ICT capital	Multi-factor productivity	GDP growth
		IT equipment	Communication equipment	Software	Total			
Australia	1.36	0.30	0.09	0.14	0.53	0.58	0.75	3.22
Austria	0.65	0.19	0.04	0.1	0.27	0.30	1.26	2.48
Belgium	0.21	0.33	0.06	0.07	0.46	0.28	1.31	2.27
Canada	1.02	0.21	0.07	0.14	0.43	0.65	0.32	2.42
Denmark	0.24	0.35	0.02	0.19	0.56	0.43	0.74	1.99
Finland	-0.21	0.08	0.04	0.12	0.23	0.28	1.81	2.09
France	0.05	0.12	0.05	0.16	0.32	0.38	1.15	1.90
Germany	-0.27	0.16	0.05	0.08	0.29	0.28	0.85	1.14
Ireland	1.16	0.11	0.05	0.06	0.23	0.60	2.86	4.82
Italy	0.33	0.11	0.08	0.07	0.26	0.49	0.15	1.23
Japan	-0.36	0.22	0.05	0.13	0.40	0.49	1.45	1.97
Korea	0.63	0.11	0.11	0.15	0.38	1.32	3.76	6.07
Netherlands	0.85	0.23	0.07	0.14	0.44	0.39	1.10	2.78
New Zealand	0.73	0.19	0.15	0.16	0.51	0.40	0.68	2.32
Portugal	0.47	0.23	0.12	0.01	0.36	0.48	1.29	2.61
Spain	1.27	0.16	0.11	0.12	0.39	0.80	0.44	2.90
Sweden	0.19	0.28	0.04	0.24	0.56	0.37	0.85	1.97
Switzerland	0.36	0.17	0.07	0.14	0.38	0.39	0.54	1.68
United Kingdom	0.45	0.29	0.07	0.2	0.56	0.40	1.26	2.68
United States	0.73	0.25	0.1	0.19	0.55	0.32	1.02	2.62

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Contributions to GDP growth

Average annual growth in percentage, 1985-2009 (or closest comparable period)

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